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User-friendly Video Production Model for Healthcare Professionals

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The goal of the thesis was to develop a user-friendly video production model for healthcare professionals. The focus was especially on issues related to recording and processing video material. The key question in the start of the project was: What is hindering or slowing down health care professionals who use recording systems from producing and publishing adequately good quality videos.

The thesis was made for a Finnish company specialized in video recording and training procedures in the health care industry. The project was part of the company's development project, purposed to further develop a recording system meant for healthcare professionals. The system includes a camera, recording software and cloud based sharing and storage service. The long term goal was that the company could utilize the research data and the suggestion based on the data in the development of the recording software.

The thesis was carried out from a user centred standpoint. Diverse user information was needed in order to recognize issues and hindrances. The material was collected through the means of focused interviews. In order to gain user information that is as comprehensive and objective as possible, there were interviewees from all three user groups. The user groups are key opinion leaders, whose opinions and doings are followed closely in the industry; teachers and lecturers, who use the systems as a tool for teaching; and general users, for example dentists and dental surgeons.

Based on the collected information the main hindrances for each user group were recognized. The functions of the recording software were found to be operational and useful, but there is a need for clarity of use and additional features. Based on the recognized problems, solutions were proposed and a model example of the video production process was simulated using existing freeware. The documentation of the simulation is part of the thesis. The proposed solutions are used as part of the company's product development.

Keywords	Video production, User centered design, focused interview

Tekijä Otsikko Sivumäärä Aika	Miia Kerman Terveydenhuoltoalan ammattilaisen matalan kynnyksen videotuotantomalli 35 sivua + 5 liitettä 27.4.2018
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Insinöörityön tavoitteena oli kehittää helppokäyttöinen tapa tuottaa riittävän hyvälaatuisia videoita. Huomiota kiinnitettiin erityisesti videomateriaalin kuvaamiseen ja prosessointiin liittyviin hankaluuksiin ja esteisiin. Avainkysymys projektin alkaessa oli: mikä estää tai hidastaa kuvausjärjestelmiä käyttäviä terveydenhuoltoalan ammattilaisia tuottamasta ja julkaisemasta hyvälaatuisia videoita.

Insinöörityö tehtiin suomalaiselle hammaslääketieteen kuvantamiseen ja koulutusmenetelmien kehittämiseen erikoistuneelle yritykselle. Työ oli osa yrityksen kehitysprojektia, jonka tarkoituksena on jatkokehittää terveydenhuollon ammattilaisille tarkoitettua videokuvausjärjestelmää. Järjestelmään kuuluu kamera, kuvausohjelmisto ja pilvipohjainen tallennuspalvelu. Pidemmän aikavälin tavoitteena oli, että yritys voi hyödyntää insinöörityönä tehtyä selvitystyötä ja siihen pohjautuvia ehdotuksia kuvausohjelmiston kehityksessä.

Insinöörityö toteutettiin käyttäjälähtöisestä näkökulmasta. Ongelmien tunnistamiseksi tarvittiin monipuolista käyttäjätietoa. Materiaalia kerättiin teemahaastattelun keinoin. Kattavan ja mahdollisimman objektiivisen käyttäjätiedon saamiseksi haastateltavia oli kuvausjärjestelmän kaikista kolmesta käyttäjäryhmästä. Käyttäjäryhmät ovat mielipidevaikuttajat, joiden mielipiteitä ja edesottamuksia seurataan alalla tarkasti, opettajat ja luennoitsijat, jotka käyttävät järjestelmää opetuksen välineenä, sekä yleiskäyttäjät, esimerkiksi hammaslääkärit ja kirurgit.

Kerätyn tiedon perusteella tunnistettiin keskeisimmät videotuotantoprosesseja vaikeuttavat seikat kullakin käyttäjäryhmällä. Kuvausohjelmiston ominaisuudet todettiin toimiviksi, mutta käytön selkeydelle ja lisätoiminnoille oli tarvetta. Ongelmien määrittelyn perusteella kehitettiin ratkaisuehdotuksia ja videotuotantoprosessin malliesimerkki, joka simuloitiin olemassa olevien ilmaistyökalujen avulla. Simulaation dokumentaatio on osa tätä insinöörityötä. Ratkaisumallia käytetään osana yrityksen jatkokehitystä.

Avainsanat	videotuotanto, käyttäjälähtöisyys, teemahaastattelu

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List of Abbreviations

NOVOCAM	Novocam Medical Innovations Oy (Ltd.).
CCD	Charge-coupled device
CMOS	Complementary metal-oxide semiconductor
AF	Automatic focus
IR	Infrared
AC	Alternating current
UHD	Ultra-high definition
UI	User interface
PROC AMP	Processing amplifier
D.D.S.	Doctor of dental surgery
BDS	Bachelor of dental surgery
MSc	Master of Science
LDRCS	Licence in dental surgery
RDH	Registered dental hygienist

1 Introduction

The thesis was made for a company called Novocam Medical Innovations and the study focuses on developing their Futudent-system. Futudent is a recording system meant for healthcare professionals, especially dentists. It includes a camera, a recording software and a cloud service.

The goal of the thesis was to find the main issues hindering health care professionals from producing adequate good quality videos and to develop an easily approachable way of producing videos, focusing especially on issues and knots related to collecting and processing the video material. The key question is: what is hindering Futudent users from publishing good quality videos.

The found issues were taken into account by collecting user information through focused interviews. Based on the found issues, some improvement suggestions were made to improve the Futudent recording software and the whole video production process. The long term goal is for Novocam Medical Innovations to be able to use the research and suggestions in the development of the Futudent recording software.

1.1 About Novocam

Novocam was started as a research project conducted at Helsinki University and Aalto University. The idea was to develop new methods for dental communication using video technologies. The recording system was called Futudent, and the company (Novocam) was spun out in August of 2011.

The Futudent-system includes a lightweight camera, recording software and a cloud service for storage and sharing platform. Novocam believes in video being a fast, clear and efficient means of communication. The system is used by dentists, teachers, students and other healthcare professionals and their patients.

In 2018 Novocam released two new cameras to expand the camera portfolio to serve more specifics need in the market.

1.2 Getting started with the process

Before starting the work on this thesis, I wanted to have a clear plan for the whole process. After reading on process planning and based on my supervisor's recommendation, I ended up taking the following process iteration image as the foundation for the design of my thesis.

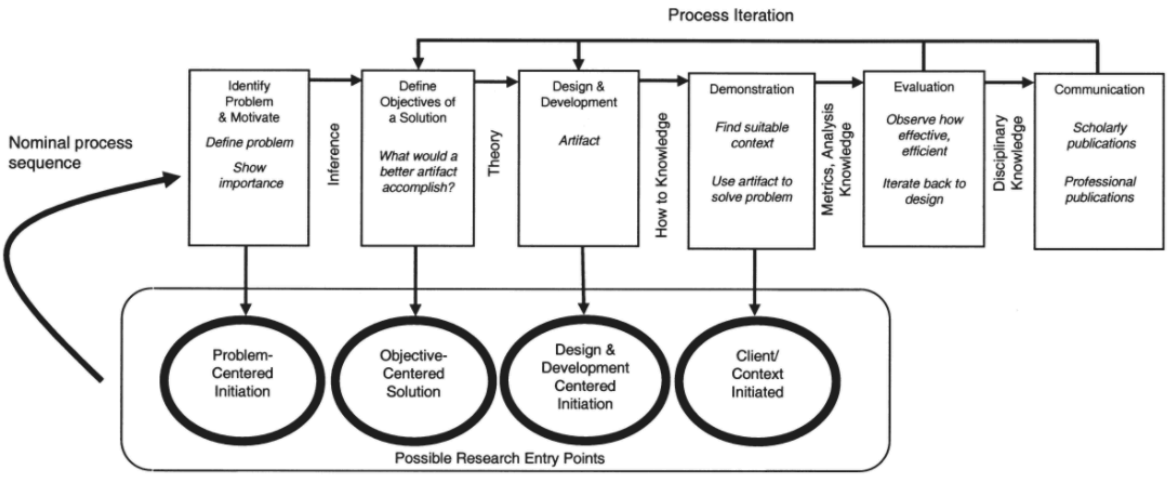

Image 1. A design science research methodology process iteration (4, p. 54)

First stage was defining the problem. This was done through collecting information from the users. Next, the objectives of a solution were defined, designed and developed. The solution was demonstrated by simulating the video production process. The results are presented in this thesis, and will be evaluated and developed further by Novocam.

2 Choosing the method of research

In order to create something new or facilitate improvements to an existing product, one has to know about the needs and desires of the potential or existing users. In this case, the goal is to improve an existing product, the Futudent-recording software, or create a supporting product (operational model) to support the use of the recording software. I have some personal experience with using the camera and recording software, but in order to define the real-life problems, obstacles and desires I needed to hear from actual everyday users.

When collecting information and defining issues, it is important to choose the most suitable methods. The most common methods for collecting information are interviewing, observing, inquiring, and studying of written material (1, s. 145). Of course this division is quite ambiguous and there can be several different categories under these methods. For an example an interview can be a depth interview or a survey interview (1, s. 145).

Interviewing gives the researcher an opportunity to instantly ask for more specifics on the newly learned information. This is an opportunity that does not occur in a questionnaire or when studying written information. It is a superior method when it comes to bringing out new viewpoints. (1, s.146)

I chose interview as my main method of research for several reasons. The strength of interview as a method is that it is hard to examine a person's doings or interests without them giving their own view and shedding light on their actions (3, s. 125). This is vital as for the obtaining successful research data, since the professionals working with video productions in the healthcare industry are the ones with the real life knowledge and experience in this case.

Despite its shortages, interview is in many ways an efficient and important method of research. Through the other methods of research, I could obtain a lot of good data but a focused interview seems to be a preferred method when the goal is not only to collect data but to obtain new viewpoints, and in this case, discerning issues and problems.

2.1 Interview as a research method

Interviews can be divided into open, semi structured and structured, based on how restricted the approach and how tightly planned the questions are. Structured interview includes questions and multiple choice answer options. Open interview is conducted through supported by the subject in question, and the interviewees selected are the ones who know about the subject in question the most. Semi structured interview is a hybrid between these two, it includes both structured questions and open themes of discussion. Structured interview supports statistical generalization and open interview supports analytical / theoretical generalization. (1, s. 145)

In an interview the interviewee is the source of information in a point of interaction through discussion. The interviewer's job is to help the progress of the conversation (1, s. 146). The goal is to collect real and useful information.

For the interview to be successful you have to aim to minimizing misunderstandings and factors that may distort the answers. An interview is a sensitive situation in the sense that if the interviewee is not feeling comfortable, he may not answer the questions truthfully or he may leave some important things out. The interviewee may also be inclined to trying to please the interviewer and give answers that terminological in exactitudes or ones that they think the interviewer wants to hear.

The interviewer also can act in a way that he only hears the things he wants to hear, that is the things that support his research frame. When the interview is taking place he should try to see things from the interviewee's perspective. The interviewer needs to be able to adapt and even have empathy. Adaptation in this case means that he should know and be able to identify with the position and outline of the work assignments of the interviewee. (1, s. 146)

In interviews concerning product development, a major risk lies in the fact that people talk about what they should do and should want, rather than what they really do and want. A common phenomenon is the so called techno-babble: talking about a new technology in a way one is supposed to talk about a new technology, based on media, advertisements and mundane conversations. This results in very little personal experience coming up. (3, p. 125)

Sampsa Hyysalo (3, s. 125) has listed a few key factors that have an effect on the answers:

- what the questions consist of and how they are worded
- the environment the interview is taking place in
- the roles and moods of the interviewer and interviewee

The interviewer has to pay attention to being as objective as possible and determining the key issues mentioned in the conversation, and giving the right value (not exaggerate or underrate) to the secondary issues.

2.2 Dramaturgical model

Myers and Newman (2, s. 16) have suggested the following eight-point guideline for an interviewer. It describes the interview instance as a dramaturgical event. I found the model useful when preparing for the interviews.

Suggested guidelines for the researcher / interviewer

- Situating the researcher as actor.

The interview is a social encounter. The interviewer should situate themselves as well as the interviewee. Answering the following questions: Who are you? What role are you playing? What is your background, experience, gender, age, nationality? Having these things in writing so the readers can access the validity of the findings.

- Minimizing social dissonance

It is important to minimize everything that might make the interviewee uncomfortable. This improves the quality of disclosure. Especially managing first impressions is important.

- Represent various “voices”

In qualitative research it is usually necessary to interview a variety of people within the organization. The idea is to try not emphasize one voice and avoiding elite bias.

- Everyone is an interpreter

This is to point out that each interviewee is interpreting the words of the interviewer as well as the interviewer is interpreting the words of the interviewee. The interview is usually a rare and artificial event for most subjects and it leads to creating, reading and interpreting of written texts.

- Use Mirroring in questions and answers

Mirroring is taking the words and phrases the subjects use, when constructing the next question or comment. This way the interviewer can focus on the interviewees world their language instead of imposing their own. The idea is that the interviewee describes and

explains their world in their own words. It is good to go from the general to the specific. The role of the interviewer includes listening, encouraging, prompting, and directing the conversation.

- Flexibility

Semi-structured and unstructured interviewing doesn't use a complete script so flexibility, improvisation and openness is required. The interviewer should be prepared to explore interesting lines of research and look for surprises. The interviewer should notice different attitudes and take account of them (awed, bored, deceiving, fatigue, show off, shy, and confessing).

- Confidentiality of disclosures

It is important for the researcher to keep all records of interviews confidential and secure. Sometimes it may be profitable to provide early feedback to subjects and organizations and to check with them about factual matters if needed.

- Ethics of an interview

It is important for the researcher to maintain ethical standards.

(a) Permissions - obtaining approval for the interviews from the appropriate ethics committees and obtaining permission from interviewees and if appropriate, their manager

(b) Respect - treating people with respect (before, during and after the interview), respecting their time, their position within the organization and respecting their knowledge

(c) Fulfilling commitments to individuals and organizations. This means protecting the obtained information and checking with them about the factual matters, if needed

There seem to be multiple benefits of taking the dramaturgical model into account. It helps the researcher to realize the multilateralism of the interview process. It makes it easier to notice the challenges and possible risks and issues, so that a good and balanced interview can be conducted. It shows the importance of the role of the interviewer, how they need to be ready to improvise and be flexible. Mirroring is an important skill, since it ultimately improves the efficiency of words used by the interviewee.

2.3 Question structure and wording

It is important to understand what kind of questions suit which interview. The more I know about how the interviewees structure my questions, the better questions I'll be able to make.

The level of structure in the question - the more structure, the more the answer is predefined. For an example, in a highly structured question there can be predefined answer options. An open structured question could be for an example: "what would you like to tell me about this?" in this case, the answer and even parts of the question are completely up to the interviewee to decide. The more structured the question, the more specified the answers will be, and the easier the information to process and analyze. With a structured question it is notably easier to compare the answers from different interviewees to each other. This should be noted especially if the interview is done in large quantities. The risk with structured questions is that the question doesn't suit all of the interviewees. It narrows the received information. Structured questions only provide information on what is asked. (3, p. 125)

In product development known ignorance is much smaller problem than tacit ignorance *(3, p. 125)*. The more we know about what and how the interviewees know about the topic of the interview, the more structured questions we dear to ask.

Sampsa Hyysalo (3, p. 125) lists five basic principles for wording questions:

1. The questions shouldn't lead to a specific answer or direction; the wording should be neutral.

2. The questions should be targeted at experience, not speculation or assumptions. We tend to idealize and simplify our operations, especially when thinking about someone else's work or the future.

3. You shouldn't manipulate the results through the questions, for example by only focusing on the strong qualities of the product.

4. Questions should focus on one topic at the time, otherwise it is difficult to infer what topic the answer is about.

5. Questions should be open concerning the answer, unless the optional answers are undoubtedly pre-known. Especially yes/no -questions can be misleading, because they force the interviewee to adjust their thinking to black and white, even if the issue was more eclectic and the answer wasn't one or the other but somewhere in the middle.

2.4 The Interviews

In order to get reliable and diverse user information, I conducted five semi-structured interviews. The interviews were done over the phone or skype and they lasted about 20 minutes. There were 13 questions / conversation topics to guide the conversation,

Two of interviews were done in Finnish and three in English. The conversations were recorded with the interviewees consent, and transcribed into a clean read transcripts. I also took notes during the interviews but relied quite heavily on the recordings and transcripts. Based on the clean read transcripts I wrote more structured and focused versions of the interviews. Those are as attachments.

In a project in which the long term goal is to improve an existing product, it is essentially important to get feedback from the users of the product. First, I wanted to determine different ways of using the Futudent-system and see what the main user groups are.

There are three main user groups: "key opinion leaders", consisting of i.e. lecturers who are using the Futudent-system for demonstration and recording purposes. Typically, key opinion leaders are individuals in an industry who are looked up to and who other individuals come to for advice and information. This is a group of professionals whose opinions and recommendations are listened to by other professionals. Secondly there are teachers, who use the system in their teaching, and thirdly the daily users, including general dentists and surgeons. (9)

It was important to include expertise from all three of these groups to the focused interviews. Some of the interviewees could fit under more than one of the three user categories, for an example working as a dentist or dental surgeon, but also teaching and training future professionals.

The purpose of the interviews was to find out what are the main hindrances keeping the users from producing adequately good quality videos. I also wanted to hear about possible improvement ideas, especially for the Futudent-recording software, and to be available to take note of any other issues and concerns they may have with the recording system.

Interviewees:

- Dr. Sonny Torres Oliva D.D.S., “The Zentist”. Cosmetic and restorative dentistry in Manhattan, New York.
- Dr. Eric Smith D.D.S, MD. General, cosmetic and restorative dentistry in Ypsilanti, Michigan.
- Dr. Peter Hunt BDS, MCs, LDRCS ENG. Dental implants and rehabilitation in Philadelphia PA.
- Senior lecturer Ulla Marjosola, Oral and health care education.
- Senior lecturer Johanna Manninen MSc, RDH, Oral health care education, “digi-mentor” of the healthcare lines of study.

3 Concept design

User and usage information is needed in the concept design process to create initial ideas, product concepts and requirements analysis. We need to know what the users do and need in order to evaluate a products’ features, profitability, marketing and distribution. (3, p. 220)

Based on researches (Berliner & Brimson, 1988, Keinonen & Jääskö 2004b, Ulrich & Eppinger 1995) it is sensible considering time consumption and finances, to invest in the early stages of the product development process instead of pushing to the execution phase as fast as possible. Mistakes and successes tend to multiply in effect, so it is worthwhile to invest in the early stages. (3, p. 221) The need for user information recurs throughout the development process.

Essential needs for user information analytically categorized by Hyysalo (3, p. 222)

- Background information concerning the use and competition and market information are needed for creating product ideas and early stage development.
- When you move from ideas to concept plans, user information is needed for defining objectives, functions, requirements as well as characteristics.
- Choosing between alternative concepts or possibly combining them takes understanding about the users' actions and needs
- It is important to recognize needs for additional user information throughout the process

In this project I have taken into consideration especially the second point, defining the concept plans tightly based on the information gained from the users through interviews.

In concept planning it is good to have the main facts, assumptions and user experience information available in a format that is easily accessible for re-examination and communication. It is also important to be able to refine the answers as the planning process brings out new and more specific questions about the details and features of the product. (3, p. 222)

3.1 User centered design

In user centered design the usability is the starting point of the whole design process. The user is an essential part of the design process. Usability, as a property of a product, describes how fluently the user is using the functions of the product, in order to get to the desired goal (12).

The first step of user centered design is to direct the design teams focus away from the system and fix it on the work of the users instead. Understanding the work or the users is the primary goal. One way of doing this is applying the contextual design –model, which is a seven phase model (12, p. 143).

1. Contextual inquiry: The users are interviewed and observed

2. Work Modeling: The users' working habits are turned into concrete and detailed models.

3. Consolidation: Information from different users is combined and models are developed based on the routines of the whole population

4. Work Redesign: A planning group discusses about improving working habits, based on the information from phase 3.

5. User Environmental Design: A bases for a new system is created, which shows the true course of the work tasks.

6. Mock-up and tests with customers: prototypes of the system are made, and they are improved together with the users

7. Putting into practice: The new system is implemented and tailored to suit the work environment in such manner that the main features of the system don't lose their meaning.

3.2 Technical design

After concept design comes the more detailed product design and its final implementation or programming. The implementation phase is often considered the actual product development. The execution and implementation phase often includes challenges with presenting, interpreting and modifying user data, and documenting these things.

Moving from conceptual planning and ideas to technical product design, and making the product concrete can include many difficult decisions. Many methods have been developed to make this process easier.

Requirement analysis is one of the most commonly used tools in solving this dilemma. Requirement analysis only supplies limited support when changes occur and decisions need to take place. The same fixed asset can be executed in many different ways. Other tools for the implementation phase are personas, scenarios and service descriptions, in which the point is to not "lose the user" as the design is developed. (3, p. 258)

4 Video Productions

It should be noted, that an average video production is executed with a team or group of people, who all have their assigned roles. However due to the nature of the work of healthcare professionals, their video productions are typically executed by individuals. In this section I refer to the person making the video as the producer, although he or she most likely covers the roles of the entire production crew.

4.1 Video Production basics

There is an abundance of consumer level videography products today, which are more than competent to record great quality video. Same goes for the Futudent-cameras. The issue is not the equipment, it is how to use it in the right ways and how to tell a story.

You may have a good idea or vision for a video, but that in itself is not enough. Just showing what is going on is not adequate. You have to pay a lot of attention to how you present your subject, because the audience's response arises from it. You need to choose your images and audio carefully, to convey your ideas in an interesting and persuasive way *(*5, p. XVIII). If the video is not well produced it takes away from its effectiveness and it causes the video to not have the impact you are aiming for (5, p. 8). A lot can be adjusted and fixed in the post production of the video. However, the foundation for a great video is a good quality recording.

Gerald Millersons foundation of know-how for a successful video production (5, p. 3)

- Knowing how to use the equipment properly
- Knowing how to use the equipment effectively
- Knowing how to convey ideas convincingly
- Knowing how to organize systematically

Video productions range from large productions intended for mass distribution to economically budgeted productions designed for a specific audience (5, p. 1). Of course there are differences in the opportunities, facilities and availability of professional grade equipment when it comes to the scale of the production. However, there is no reason why the end products should differ in quality, when it comes to the audience (5, p. 2). What is done is more important than how it is done.

A video production is typically divided into three stages: Preparation, production and post production. Preparation includes refining the idea, setting goals, scheduling and writing the script and production plan. Production is when all the planning during the preparation stage is executed. Post production stage is sometimes called the editing stage; it includes assembling the produced material according to the script. The following list is divided into more specific categories, in order to be more specific about how video productions are typically partitioned.

The Idea

The two main things to consider when planning a video production project is the production as a whole and the audience (5, p. 8). The main purpose of the video should be carefully defined and thought through, in order to make suitable decisions concerning the production. There is a difference between a video of which purpose is to educate or persuade and a video which' purpose is to entertain.

As the main purposes of the videos shot with the Futudent-cameras are education and documentation there might not be need for some aspects of productions which are important in entertainment, for an example. The subject or topic to be covered in the video is known. This doesn't mean that the planning stage should be neglected, just that the focus is different. In planning it is important to think about the target audience of the video and categorize it (for example, what age group is the video for, is it for the general public or a specific audience.).

In relation to the idea and preliminary concept of the video it is good to determine the goals and objectives - what should the audience have learned and know after seeing the video? The answer to this question guides the entire production process. (5, p. 26)

Organizing

A large part of organizing a video production is choosing the production method. Production method determines how the idea is turned into something concrete. Coarsely, production methods can be divided under two categories: empirical method and planned method. Empirical method is based on instinct and opportunity, planned method relies on a premeditated plan (5, p. 32).

There are a lot of decisions to be made during the organizing stage. If the production is carried out with a team, the team needs to be informed and trained. Choosing the means of communication and transportation if needed, figuring out technical details, choosing the right equipment (cameras, lights, audio recording etc.). These are all part of getting organized in order to have a successful production.

A script forms the basis for a plan. There are several types of scripts, and the kind of video that is being made will determine the type of script suitable to be used. In some cases it can be as simple as a few informal notes, but a script helps the director to clarify his or her thoughts, and assess the resources needed for the production (6, p. 44).

With video productions in the healthcare industry, the organizing stage is usually pretty straightforward. A dentist is familiar with the operation or procedure he or she is about to record. The production is generally carried out by a one or two-member team. It can be as if the team already went through the organization stage without dedicating a separate meeting for it. The important thing is, however, that the whole team is on the same page, and there is a plan.

The Story

If the story in the video is not displayed carefully, the audience may be left confused or even not finish watching the video. This can be caused by multiple things. The audience should be allowed enough time to interpret what they are seeing (5, p. 143). Poor duration of a clip can cause the audience to miss an important point. Because of bad cropping the viewers' attention can be drawn to the wrong, more prominent looking part of the image (7, p. 101).

The directors goal should be to help the audience understand and to guide their thought (5, p. 143). A good guiding thought when making a professional video of a healthcare procedure is that each shot and clip used should be relevant and move the story forward.

4.2 Shooting video

A camera can only channel certain parts of what is happening and what it's being pointed at. It will not show all the information that can be observed on-the-spot. If a dentist shoots

a close up image of a patient's tooth, for an example, it will give the viewer details, a good insight of the condition of an individual tooth. The viewer cannot, however see what kind of facility the image is shot at, or even the general condition or the patient’s teeth. That would require a wider shot.

It should be taken into consideration that the viewer of the video does not have the same familiarity with the circumstances in which the video is being made, as the maker of the video. This is quite self-evident, yet often easily ignored. The director, having spent a considerable amount of time on the project, becomes very familiar with the location and the idea of the scene being shot. But the members of the audience are learning new information throughout the duration of the scene. They are interpreting the images and shots as they see them, and there usually is not a lot of time for processing the information. (5, p. 24)

With a dental video production, the previously mentioned “location” can be compared to the procedure that is being recorded. The professional recording the video is familiar with the steps the operation includes, and knows by memory what the different stages look like. It should be kept in mind that the audience only sees as much of the situation as the camera shows. Due to the familiarity it can be difficult for the professional to keep a fresh eye on the progression of the procedure, which can lead to misunderstandings on the audiences’ part.

There are two different ways to shoot a video production: single-camera production and multi camera production. In a single-camera production one camera is used to shoot the video or segment. The advantages include portability and flexibility, it is very suitable for lightweight productions and allows the producer to do one thing at a time. It does not suit all situations, however, for an example a sports event cannot be effectively shot with a single camera. Multiple cameras are needed when continuous action is recorded and there is a need to change the camera's viewpoint. (5, p. 51)

Most productions shot with Futudent-cameras are single-camera productions. However, there are great advantages in recording with several cameras, or using a Futudent-camera as part of a multi camera production. For a dentist, having a second angle of the mouth while shooting a procedure can add great value to the footage. For a teacher of dental hygiene, having another camera recording work ergonomy and maneuvers of the teacher can be just as essential as recording the procedure itself.

Using the camera

Things to consider before recording

- How should the image be composed?
- What would be the ideal way to crop the image?
- What type of lighting is needed to make the shot work?
- Does the object and focus point of the image change during the shot and if it does, how should that affect the shot?
- Does the camera move during the video?
- How does the video end?
- Is the audio recorded during the shot? How?

There are innumerable amount of right and wrong answers, and when shooting a professional video, the answers to many of the questions may seem self-evident. Even if there is not a lot of variation in the subject of the video, which is the case for an example when recording a dental surgery, in order to make a great quality video out of it these questions should be considered and the shootable subject should be analyzed.

Focus

One of the foundational aspects of a good shot is having a sharp focus. Insufficient depth of field can be an issue, especially with close-up shots (5, p 127). This was noted also on the feedback from the interviewees. When using the Futudent-system, these issues can usually be corrected by switching to a lens with a longer depth of field. If this is not possible, the options are to sharpen focus on the most important part of the subject or splitting focus by choosing a compromise focusing distance.

Many video cameras have an in-built automatic focusing feature. It is a useful feature, but cannot be relied on entirely. The AF system is built on either active or passive technology, or, in some cases, a hybrid variant of the two. Passive AF systems determine the target to focus on by analyzing the image without directing any energy (ultrasound or IR waves) toward the subject. Active AF systems have self-governing functionality, by typically using either ultrasound or IR waves for analysis.

With the Futudent-cameras focusing is done manually by turning the lens. The interviewed users request would prefer automatic focus but understand the benefit a manually controlled focus has on the size of the camera.

The Camera

Video cameras today come in all shapes and sizes to suit different situations. Within the last 20 years the prices for professional quality cameras have gone down, and they are available to consumers. In an ideal situation the person operating the camera knows the camera so well that they can focus on the subject, not the technicalities. There is a lot of automation in today's cameras, but automation cannot create meaningful images (5, p. 82).

Lens technology

The lens system focuses a small image of the scene onto a light-sensitive chip / sensor (5, p. 84). There are two important features to consider when choosing a lens: focal length and the f-stop. Focal length is an optical measurement, the distance between the center of the lens and the sensor. A long focus lens gives the operator the ability to zoom in a lot, the subjects appears close and you see only a small part of the scene.

The f-stop expresses the maximum size of the aperture of the lens. The larger the f-stop number, the better the lenses performance in low-light conditions. When the aperture is open all the way, it lets the most light into the sensor. The larger the opening, the smaller the f-stop number.

Video cameras typically have either a prime lens, which has a locked focal length, or a zoom lens, which has an adjustable focal length. With a prime lens, only the diaphragm (the size of the iris) is adjustable. Changing the focal length, or zooming in, doesn’t only determine the image size, it also has an effect on the depth of field, making focusing harder. It also changes the prominence of the background and magnifies movements of the camera. (5, p. 90)

Sensors

The image sensor in is the part of the camera that forms the image, based on information it receives through the lens. It converts the image from the lens into bursts of electrical charges that transfer the video signal (5, p. 94). The sensor includes pixels, tiny analog cells. When light hits the cell it holds it as a small electrical charge.

The sensor is probably the one most important feature of the camera affecting the quality of the image. There are two main types of sensors used in video cameras today, CCD and CMOS. The use of CMOS in small consumer products has grown over the last years due to technology being cheaper and the chip sizes smaller, providing lower power consumption. CCDs are mainly used for high end video cameras. High end cameras may even have several chips in order to improve the image quality. (5)

Audio

With professional videos, it is important to record the background sounds. They are what gives the images a convincing realism (5, p. 193). The background sound conveys a lot of information. The acoustics of the space where the recording is done have a major effect on the sound quality. Tricky acoustics cause issues in productions, but a problems can be avoided with understanding of acoustics (11). In a room with mainly hard surfaces, there is a lot of reflection of the sound. This can significantly degrade the sound quality.

Commonly audio is recorded separately or using an external microphone, since the sound quality of an in built microphone in most cameras is not high. Acoustics influence the positioning of the microphone.

> To avoid unwanted reflections in live surroundings, the mic needs to be placed relatively close to the subject. If working in dead surroundings, a close mic is necessary, because the sound does not carry well. When the surroundings are noisy, a close mic helps the voice (or other sound) to be heard clearly above the unwanted sounds. (5, p. 198)

Most video cameras have a built-in microphone which can be used for picking up environmental sounds. This helps with synchronizing different video clips, even if the audio for the final video would be recorded separately.

Lighting and colors

How colors are portrayed on the video depends on the amount and quality of light (6, p. 139). When producing a video for professional use, the goal usually is to have as truthful and realistic color rendering, as possible.

The tone and color quality or light varies a lot depending on the light source. In order to record realistic color tones, the cameras color response and the color quality of the light need to match as well as possible (5, p. 235). The cameras white balance can be adjusted to respond to the color quality of the light. Some camera systems, including Futudent, have an automated white balance correction.

Typically, in a space where videos are recorded there are several sources of light. There may be daylight coming through window and dome lights in the room. Dentists and other Futudent-users commonly have a light mounted on a headband or on top of the camera, and additional working light. The mixture of lighting can cause defects in the recording of colors (5, p 235).

With fluorescent lights meant for consumer use the light is usually green or reddish and it flickers on and off on a certain frequency, determined by the frequency of the AC current. There are specially designed fluorescent lights meant for video productions, that do not flicker and the light is of a neutral color.

4.3 Postproduction

The Editing Process

In editing the video and audio clips are blended together in order to form a uniform presentation. In addition to piecing the material together, editing is the technique of selecting and arranging shots, choosing their order, their duration, and the way everything is joined together. In editing the possible graphics and music are added to the ensemble. Skilled editing is unnoticed by the viewing audience but adds to the effectiveness of the video. (5, p. 295)

Overview of the process (1, p. 301-308)

1. Select the clips to be used. It is a normal to much more footage than will be used on the final video. Sort out what to use and what to delete.

2. Trim the clips, deleting unwanted segments.

3. Place the clips into the timeline.

4. Arrange clips in the desired order. In most cases, this is chronological order.

5. Adjust transitions and effects, such as color correction and playback speed changes. With transitions, there are a few good rules to keep in mind. Cutting between two shots of the same size of the same subject should be avoided, it produces a jump cut. Cutting between static and moving shots doesn't look professional. Avoid cuts that make the object jump from one side of the screen to the other.

6. Insert additional audio. Adjust audio balance.

7. Export the final video

Editing Software

Recent developments in camera technology and equipment becoming more affordable has made video editing and post-production current for consumer markets. The existing editing systems can be coarsely divided into two categories:

- High-end level professional use systems, like Adobe Premiere
- Middle- and low-end systems, such as Lightworks and iMovie

The products in the first category provide lots of options and flexibility, but require editing skills and esthetic eye of the user. On the other hand, the systems in the second category make editing easier, because the process includes automation so some extent. The

weakness of these systems is inflexibility and the fact that the results of the editing process are not always satisfactory. (8)

Cutting

The editing process is a very time consuming phase of the post-production of a video production. In editing the video material is cut and modified, and the clips are arranged in the right order. One of the most time consuming things in editing is cutting, because it involves going through the shot material and choosing which clips to use (8).

An important but, when successful, an unnoticeable part of cutting is making the transitions. Transition in video editing means shifting from one scene and clip to another. In order to make a smooth transition you have to try to avoid focus point errors. A focus point error is when a clip doesn't fit the big picture, and the viewers focus is drawn to the wrong thing.

It should be noted that a typical operating model with the Futudent-users is to record an entire operation or procedure into one video file. This differs from traditional video productions, there usually is the option of doing retakes or choosing a clip from multiple options. This means that the cutting phase is different, it can simply mean trimming and processing one clip. It can include cutting out nonessential parts of the operation, or adjusting the playback speed of some parts - slowing down key parts or speeding up irrelevant or self-evident parts.

Post-processing

Post-processing includes among other things color and lighting corrections and other visual and audio effects. One way to harmonize footage shot with different cameras is to create a suitable filter for the video which, for an example, emphasizes certain colors.

Viewing

There is a wide range of screen sizes on which videos can be shown as indicated in table 1. This should be taken into consideration when planning for features such as image cropping and type size. How is the video intended to be seen?

Small screens	**Medium screens**	**Large screens**
Mobile phones / iPods / handheld game consoles Average size mobile screen in 2017 was 5.5 inches (13).	Computer screens, tablets, television sets	Projectors, LED panels / multi-screens

Table 1. Comparison of viewing devices

4.4 About the Futudent-cameras

Novocam released two new cameras in March of 2018, extending the product portfolio to three cameras. The Futudent-cameras are specifically designed to serve the needs of dental communications. If you were to use for an example an action camera for the same purpose, you would find that the depth of field is too shallow and the field of view is too wide. The eduCam, released in 2016, is a general purpose dental video camera that can record high-definition (1080p30) video.

In order to make such small cameras suitable for the purpose of dentistry there are some features that have been implemented in a different way, compared to majority of cameras out there today. Generally single cameras have a built-in recorder that may use a flash card or a hard drive, but the Futudent-cameras are connected to a computer or a mobile device, to utilize those for recording, preview and power. Focusing the image is done manually, and there is no inbuilt microphone.

The Futudent camera is usually mounted either on to the dentists' loupes, a headband, or it's mounted with a specialty mount unto a desk or a standing light. A loupe or head-band mounted camera provides a hands-on view, the operation is recorded as the oper-ator sees it. Desk and light mounts provide a more panoramic view with stable image. See Image 2:

Image 2. EduCam. Image: Novocam

Lenses on Futudent cameras

The Futudent-cameras come with a 16mm lens. There are also optional 25mm high magnification 25mm UHD lens, and 12mm and 8mm wide angle lenses.

Camera comparison table

Details		proCam	eduCam	microCam
Resolution	Video	4K UHD	1080p30	1080p30
	Still	8/13 mpix	2/3.4Mpix	2 Mpix
Size	(w/o lens)	32 x 28 x 23 mm		24 x 20 x 23
Weight.	(body only)	23 grams		12 grams
Built-in zoom		3x	2.5x	n/a
Strength		UHD video, high resolution, documentation	Good overall performance, affordability	Miniature loupe mount POV, Sony IMX sensor
Connection		USB2		
Lens Options		⟩ Standard 16mm ⟩ Hi magnification 25mm UHD ⟩ Wide angle 12mm and 8mm		

Image 3. Comparison of proCam, eduCam and microCam. (10)

Simulation

The simulation was done to demonstrate an ideal video production process. The videos used for the simulation were recorded beforehand by a dentist, in order to demonstrate the process with a real life case. Futudent also has a recording application for Android devices, but the simulation focuses on PC and iOS platforms, since those are generally used for editing.

Recording

The camera is connected to the computer or mobile device with a USB2, cable. The eduCam is connected with a micro USB connector. The recording software's user interface has the menus and buttons on the bottom of the screen. In gallery you can browse and watch previously made recordings and images. Camera-button refreshes the connection to the camera. The camera icon button takes a still image. The red record button starts and ends a video recording. The full screen button toggles full screen mode. The microphone icon button toggles audio mute. See Image 4 below:

Image 4. Futudent recording softwares UI

In camera settings you can adjust camera and recording settings. There are more precise settings in the advanced settings.

Available adjustments in the settings menu (11)

- Resolution – switch between HD (720p) and Full-HD (1080p). Resolution represent the number of horizontal lines on a video.
- AWB White balance – turn on automatic balancer or adjust manually. Adjusting the white balance is done in order to get the objects which appear white in person to render white in the footage. An unrealistic colour tone is usually caused by the temperature of the light.
- Zoom – The Futudent-cameras have different built-in zoom capabilities (image 3)
- Pull down camera-menu lets the user choose the image source and switch between them, for example and eduCam and the built-in camera of a laptop.
- Pull down microphone menu lets you choose the audio source

Settings under the advanced settings menu (Proc amp & Camera control settings)

- Brightness - used to customize the overall lightness or darkness of the video image
- Contrast – controls the difference in colour and brightness, typically applies gain to the red, green, and blue signals of the image.

- Hue - Hue is the colour reflected from or transmitted through an object.
- Saturation - controls the amount of grey in comparison to the hue. When contrast is adjusted, the image looks either more saturated or of the entire video image look more saturated or inconspicuous.
- Sharpness – darkens the dark areas and brightens bright areas of the image.
- Gamma - Each pixel in an image has luminance, measured by a value between 0 and 1. 0 means black and 1 is white. Cameras do not correctly capture the luminance of images but it can be corrected by adjusting the gamma.
- Backlight Comp – used to get rid of “silhouette” effect, when there is a bright light source behind the target.
- Gain - The less gain the more light is required, but the image has “finer grain” and the image quality is more detailed. With more gain, not as much light is needed but the image can get grainy.
- PowerLine Frequency (Anti Flicker) – This synchronizes the camera to the flickering of light, which’ frequency is dependable on the Hz in the area.
- Exposure – the amount of light per unit area
- Low Light Compensation – check box menu that, if checked, boosts the brightness of the image

The Futudent-recording system includes a foot pedal, which can be used to take a still image, control starting and ending a recording, and adding a bookmark.

Viewing

When recording is stopped, the recorded video can be deleted or saved. The recording is categorized and a title and description can be given. The recording can be saved to the gallery, or saved and immediately shared via email.

Through the Upload and share option, the video can also be uploaded to Futudent-cloud service, which is a highly secure cloud server that can be used for storing and sharing the uploaded material.

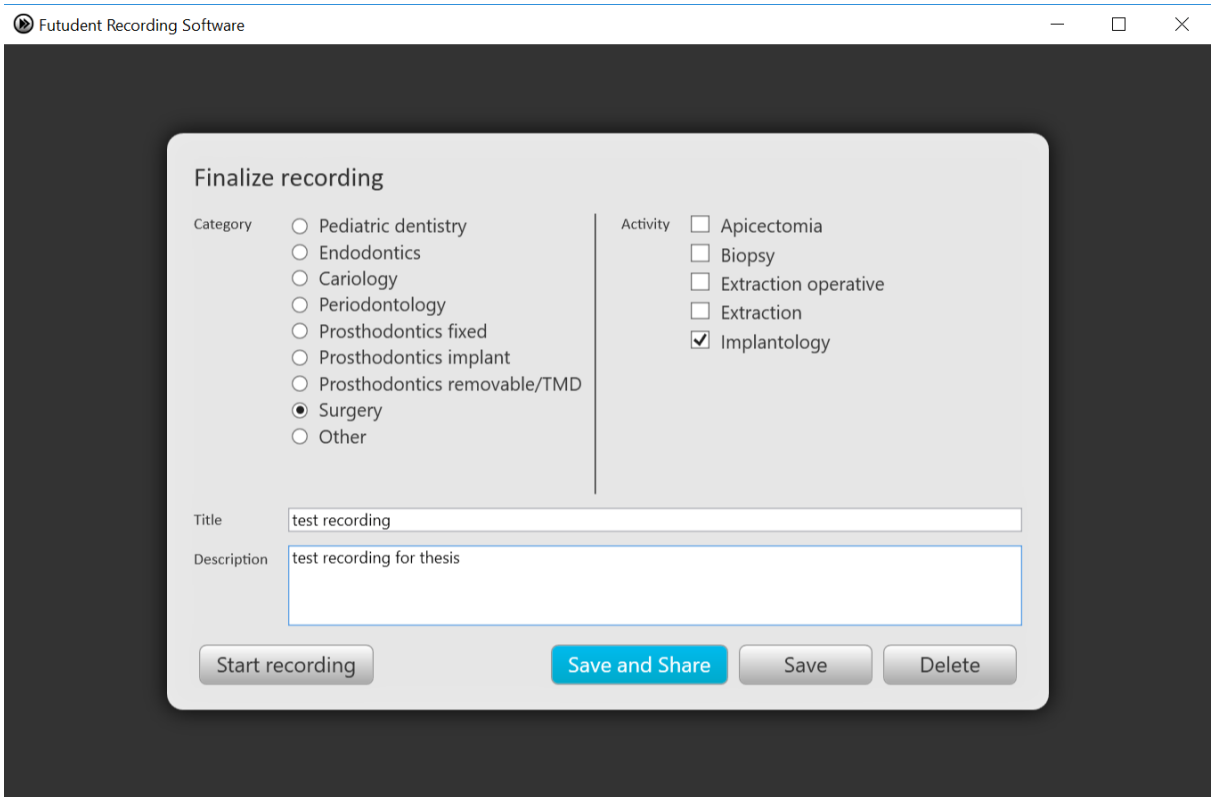

Image 5. When recording is stopped the video is categorized and saved, or saved and shared.

To view the recorded video after saving it, you can access is through the gallery or by pressing save, as demonstrated in image 5. In the preview mode, the timeline of the video is on the bottom of the view. The timeline shows the bookmarks that were added during recording. On the right are the thumbnails for the bookmarks, which also function as handles for jumping to the part of the video where the bookmark was added. The view is similar to those of the tested editing software.

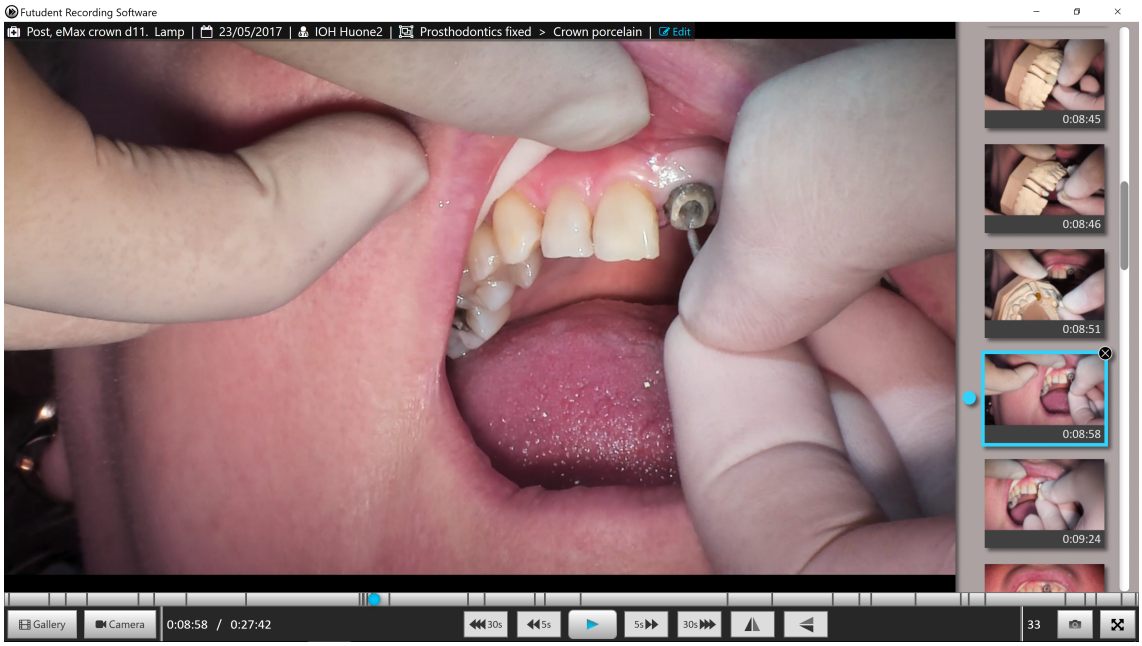

Image 6. Preview mode of the Futudent-recording software

As pointed out in image 6, the tools and options for the preview mode are 5 and 30 second jumps both back and forward, play / pause option and toggles for both horizontal and vertical image mirroring.

Editing the video

Based on the interviews, the typical way of shooting videos is recording an entire procedure or operation, and in the post production editing that one long recording. The recording is trimmed, non-essential or bad quality material is cut off, and some parts of the video are sped up, slowed down. In some cases, still frames are added.

Audio for background sounds is recorded with the video. The producers' commentary is recorded either simultaneously with recording the video, or after the cutting stage, when the composition of the video is final. Sometimes image qualities need to be adjusted, like colours or lighting. In some cases, titles and possible intro and outro clips are added.

This process was also the framework for the simulation video, and bases for the minimum requirements for the editing software.

Choosing the editing software

There are several free editing softwares available today. The criteria were that the software should be free and easy to use. Finding a free editing software which works well on both platforms and has all the required functionality was challenging. The editing software chosen for testing were Lightworks, VSDC Video Editor, iMovie and OpenShot. IMovie is free on Mac, the other softwares are free for both Mac and Windows. OpenShot had several issues with scalability and crashing, on both Mac and Windows.

Lightworks by Editshare LLC is a professional grade software, which is free for registered users. There is also a chargeable “Lightworks Pro” available, but the free version has all the needed features. In Lightworks a new project is started, and the clips that need to be edited are dragged to the timeline. The clips can be trimmed, cut, copied and pasted. There are four tabs for different modes. The LOG-mode controls the project content, EDIT-mode is for cutting and editing the clips, VFX is for effects, like colour correction and transitions and in AUDIO-mode audio tracks can be added and adjusted.

Editing with Lightworks takes some getting used to, but with some browsing around I managed to do the relatively simple tasks that needed to be done to the demo-video. Compared to the other tested software, the interface is quite complicated, there is a lot of clicking and more steps, but there are also advanced editing tools, more functionality. See Image 7 below:

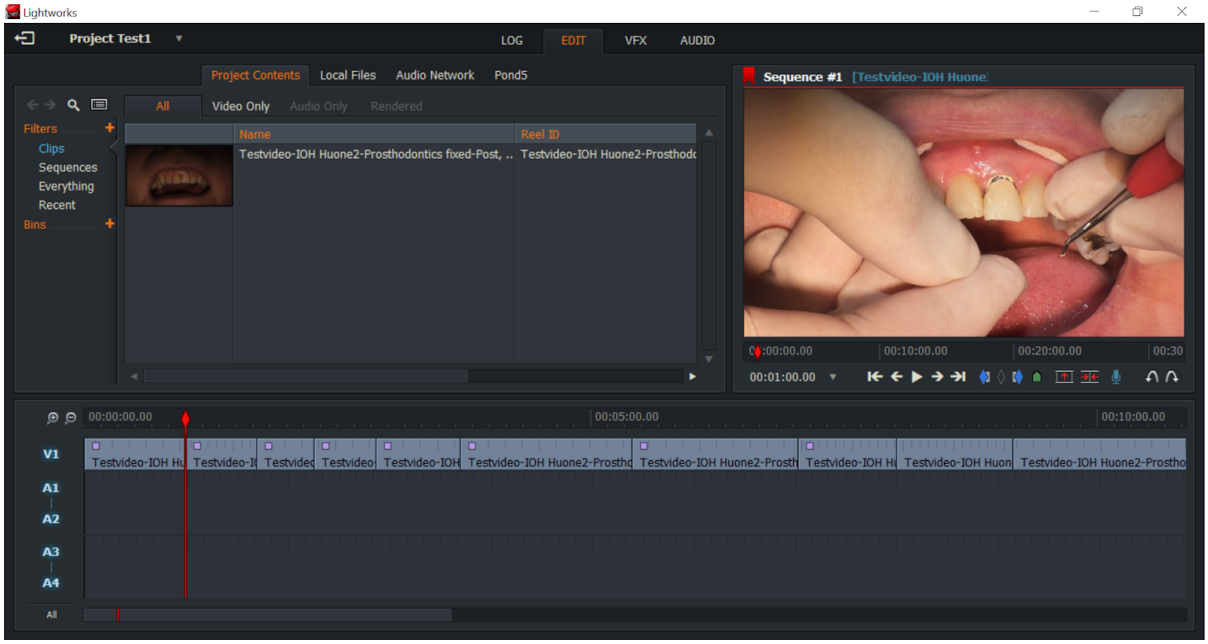

Image 7. Lightworks timeline

iMovie is a free software for Mac, developed by Apple. Compared to Lightworks, iMovie is more compact, it has less functions. On the other hand, it is very simple to use and includes all the tools listed on the minimum requirements.

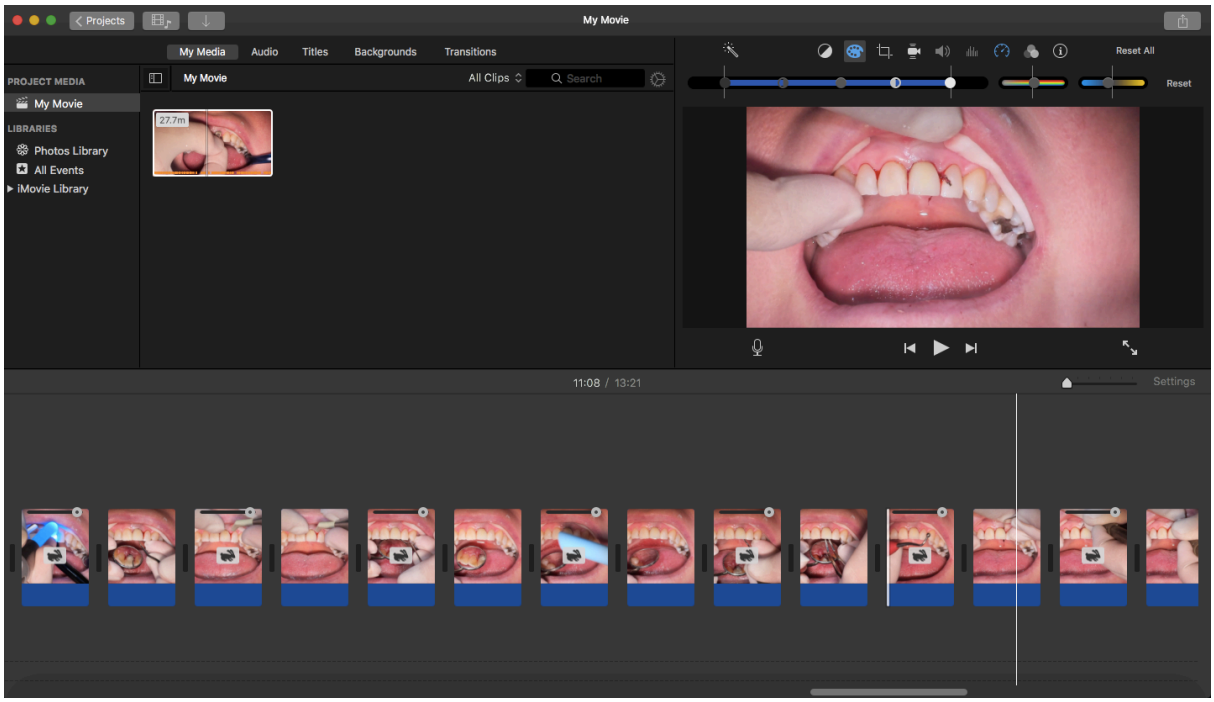

Image 8. iMovie timeline

The VSDC Video Editor has a wide selection of transitions and effects. As shown in Image 8, the interface is quite unusual looking and a bit more complicated, but the editor has all the needed features.

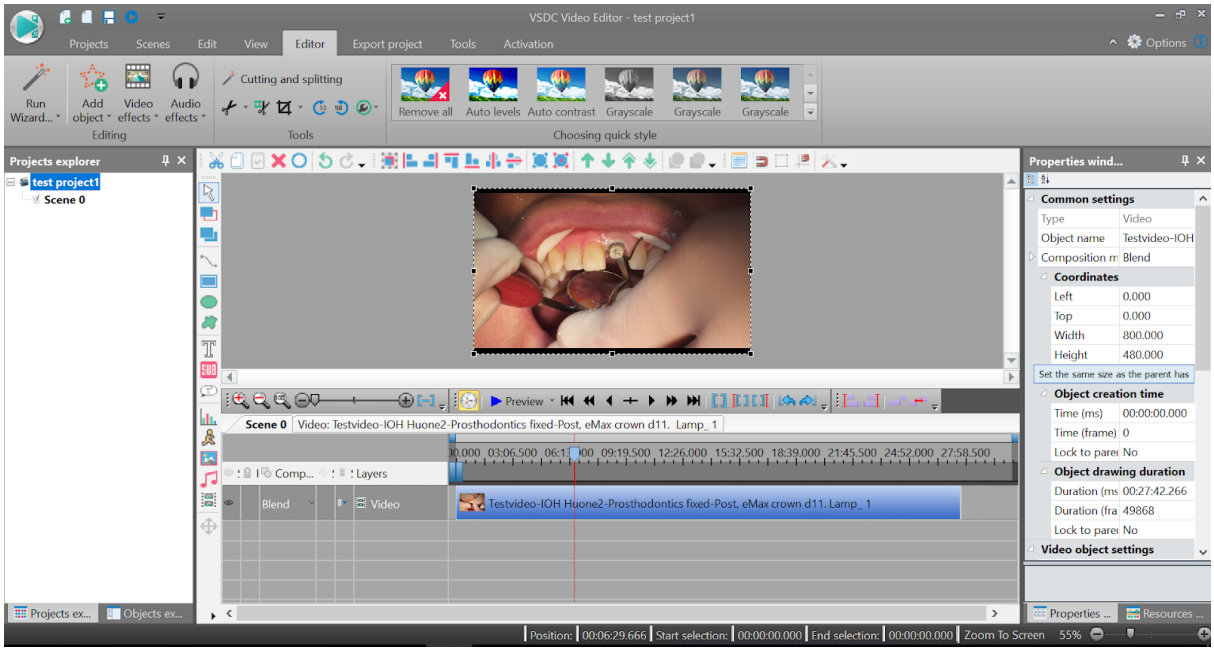

Image 9. VSDC Video Editor timeline

The tested editing software are all quite similar. There is a timeline on the bottom of the image and a preview screen on the top. There are not any major advantages to choosing any one of them, some have more functionality, but advanced editing tools are typically not needed by an average health care video producer.

The Example Video

The end result of the simulation was an edited example video of a prosthodontics procedure, a crown replacement. It was recorded beforehand with a lamp-mounted eduCam. The example video included titles that stated the transitions between different phases of the operation. The video had minor colour corrections and lighting adjustments. Non-essential parts were cut out and slowly proceeding parts were sped up to 200% speed. The original duration of the video was 27 minutes 42 seconds, and the edited videos duration was 13 minutes 15 seconds. The example videos editing process was simulated with iMovie, Lightworks and VSDC Video Editor. The video was exported into HD quality (1080p) .mov video.

5 Observations and suggestions based on the interviews and simulation

There weren't issues that came up in the interviews that were common to all interviewees. Different user groups seem to have different improvement needs. The general observation was that advanced users want more adjustability and control, and basic users want more automation.

Based on the interviews it became evident that the users are not aware of all the features and possibilities of the recording software. In most of the interviews the users expressed needs for features that already exist on the software. Many of the users were not familiar with the adjustments found in the settings and advanced settings menus. There is a need for the users to be familiarized with these options, information about the features of the recording software should somehow reach the users better.

All of the interviewed users edit the videos they record. One of the common complexities with the interviewees' video productions was time consumption. Editing takes a lot of time. Moving video files from one location to another takes time. Cutting down the time used on editing and simplifying the process is one of the keys to increasing the usage of videos in the industry. The recording software does not have in-built editing tools. After a recording is saved, it can be viewed in an effective way by utilizing the 5 and 30 second jump back and forward buttons, and image mirroring, if needed. These are good preview tools, but based on the feedback received through the interviews, there is a demand for some editing tools on the software.

The primary suggestion is that the recording software would be expanded and video editing would be made possible inside the software. The editing tools "cut" and "paste" would implemented in the software. These are the most used tools in the editing process. By expanding the software from a recording and viewing software to an editing software, the users could cut out unessential parts of the video and publish videos that are compact and dynamic. This is the foundational need in making the recording software more multifunctional and focusing the video process on the Futudent-recording system platform.

Having the option of processing multiple clips on the timeline and being able to change their order would eliminate the need for a separate editing software. Being able to easily

trim a video immediately after recording and viewing it, would diversify and take the software more towards an all-in-one type of a solution in covering the video production process in the health care industry.

The bookmarks in the recording system are a major asset in making the editing process more dynamic. The bookmarks allow the user to mark points in the recording, and easily jump and browse between those points in the preview mode. They are a very usable and time saving feature. It would be ideal if they could be utilized as part of the editing process.

Secondary suggestions

The users expressed several improvement ideas for the system, features that they would like to have in the system in the future.

For further development and diversification of the editing features it is recommended that other editing tools are added. A major operation in the example videos was changing the speed of slowly progressing clips to 200%. In some cases, it is good to have the option of speeding up a nonessential clip, instead of cutting it off entirely. It gives a more realistic idea of the procession of the recorded operation. It would also be useful to have the option of having slow motion clips, and even still frames, to properly display critical parts of an operation. It was also requested by the users, that the playback speed on the preview mode of the recording software could be adjusted.

Some basic post processing tools would also be of added value, if the software's features were expanded from recording and previewing also editing. The possibilities for adjusting the image options while recording are quite extensive, but due to the nature of the users' work, they may not have the time or possibility to make adjustments before or during recording. Having the ability to adjust brightness, contrast, white balance and colour balance are basic features of an editing software. Some users, especially the more experienced ones, would also like the software to have more options with file formats, image quality and export pre-sets.

6 Conclusion

The purpose of the thesis was to find out what is hindering health care professionals, especially in dentistry, from producing good quality videos. By interviewing users from different user categories, some issues and development ideas were brought up. The latter part of the production process was simulated using the Futudent-recording system and three different editing software. Based on the information gained from the user interviews and the simulation, some suggestions for improvements were made.

In order to make the recording software more comprehensive and the video production process more straight forward for the users, it was suggested that basic editing features be implemented into the software. In addition to the implementations, it was noted that there is a need for information concerning the features of the recording system to reach the users better. The recording software's bookmarks-feature is an asset that should be utilized.

Novocam plans to use the user information collected in this project as part of their product development.

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Interview Questions / Topics

- Describe the role of video in your daily work
- What equipment do you use for making recordings?
- What is the target audience for the videos you make?
- How do the viewers view the videos?
- Describe your video production process
- What challenges do you face when producing videos?
- What do you find difficult when recording videos?
- Do you edit your videos?
- Challenges with video editing
- What editing tools do you use?
- Do you publish your videos publicly? How?
- Challenges with publishing
- Describe your ideal video production process

Interview 1 – Dr. Peter Hunt

Background

I specialize in dental implants and oral rehabilitation. I studied in the Great Britain back in the 1970s, I graduated and did a couple of residency programs in dental surgery in Great Britain and then master's degree also in Great Britain and then I got a scholarship from the American ambassador in London to the University of Pennsylvania where I studied periodontics and switched to the combined programme of periodontics and reconstructive dentistry.

Since that time, I have toured around the world a little bit and practised around the world and help start up a few dental schools, one in South Africa, one in America. Now I'm spending more time working, doing more sophisticated work than I have ever been able to do before.

Describe the role of video in your daily work

For the last 7 years or so I've been running a website which has been worked on recently and now I am opening it back up in a few weeks' time, a better and improved website. So one of things I do is I collect videos from people around the world, we have had members in about 85 different countries. On the website we have lot of case presentations, slide presentations but we're also adding an increasing number of video presentations. So I have gotten quite used of doing video over the last few years and found that we will be using more and more video. I do my own recordings, and I do all my own editing and we do it all in-house.

So it is an exciting time in dentistry, very active, and if I go back a few years ago the changes between what we were doing then and what we are doing now is pretty dramatic and it means that we can work faster and better and more predictably, so for example we incorporate much more in the way of surgically guided protocols into the procedure and we do most of our cases immediately after the tooth is removed and we are also doing a lot of immediate restoration. The restoration technology is very much more developed and sophisticated.

There is a big difference between a slide representation and video representation. Video representation is better for showing an individual procedure and taking it in. But it is not very easy with a video setup to able to show the total progression of the case from where you first see and examine the patient, where you take the x-rays and examine those and then you do the surgery and then the various other procedures in order to restore, so sometimes that's better shown with a slide presentation instead of videos. It is very important to be able to see the progression of the case from the beginning to the end and to show how we strategize, because it is very important with many of these cases to be sophisticated in the case management, otherwise people can take endless amounts of time treating a case and they fail to appreciate some of the very important factors.

I am very lucky I have been able to train and specialize in periodontics and reconstructive surgery. I do worry because many of the traditional techniques are being abandoned these days and it is becoming much more cosmetic. There are specialists but are they being taught properly and are they getting enough experience at it. We are also having a problem, because we have a big evolution happening in restorative technology, away from traditional cast metal structures and production, so there is a huge change going on and most people's experience or training is not enough for them to be able to come up with good final product. It is a bit of a "mish mash", so there is a lot that needs to be done. The profession is changing faster than ever before and we need to upgrade our educational technology as well to be able to help people, pick up and realize the differences for all these subjects evolving.

What equipment do you use for making recordings?

I have a high-end video camera which I have mounted on a chair, we got a good lens on it and it works quite well for us, there are more sophisticated versions of it now, but it's still very good and that's the main thing. And then about a year or so ago I got one of the Futudent-cameras and that's also been interesting to work with. I really wanted to get the operators view so to speak and we have been playing with that a bit and trying that out.

What is the target audience for the videos you make?

It is the dentist who are interested in implantology. The field is expanding out a lot these days so it is not only implantology I believe it is also regeneration, soft and bone tissue regeneration. You also have to have great interest in technology, because things are changing and developing so rapidly. And I believe you need to have good view for rehabilitation, the restorative technology which again is also changing dramatically in the press of time.

What challenges do you face when producing videos?

The biggest trouble frankly is, I am looking it two ways, as a surgeon I am doing the best for the patient and the trouble with that is that I am sometimes leaning in a bit too much and I am blocking the camera view and I don't have somebody telling me to “Get out of the way” or whatever. We find some blocked shots and particularly when I got my hand right up in there that is a problem.

Most of the procedures I record are not that special, they are routine procedures, so even if I get a bad shot of something I want to get on with it and then I am prepared to spend more time on, when the patient is gone, in the editing process. Usually we can get enough good material to be able to make it a valid story and a good learning protocol. And then I do the commentary once I have edited it. Between all the different assets we tend to come up with, I think the end results are pretty good videos.

It does take quite a time to get to a sophisticated result. The problem is, we see great videos every day, when we watch television or whatever it may be, so to come up with something that is just less competent, people don’t want to watch it. I think in order to make good videos you have to spend a lot of time and get fairly sophisticated. People don’t have a lot of patience for watching video where they can’t see what you are talking about, where you got gloves in the way and you can't see imagery properly so this is where a prolonged editing process is very necessary. I truly believe that’s the way to do it. And that also brings it down to reasonable amount of time for the length of the video.

What do you find difficult when recording videos?

I haven't fully incorporated the Futudent-system in as much as I wanted to in the first place because I found it a bit cumbersome with the cord on the back of my head. I also

have to crop the footage quite a lot in the editing and the quality of it was not quite what I was looking for and I found focusing quite of an issue and things like that. I think it is rather issue of me getting more experience with it. I thing one thing that is going to make a big difference is the rotational capability of your new ball mount that you have and I think that will help a great deal. It is a matter of flinging myself into the deep end.

The focus is one issue and the second point is the rotational aspect of the camera and essentially I would always want to have a view which is slightly larger field, because that way it gives me the ability to edit it, zoom in and narrow it on the subject that I am really looking at. If I am really trying to do it with the camera that means I need the patient really steady, my head really steady, everything really steady, so it becomes bit of more of a issue. The biggest problem so far has been this issue of rotational aspect of it because that means that I have to cut quite a bit in order to get the right crop, but that I think is now going to be past and we will be able to move onto much greater use of the Futudent-system. I am looking forward to it because I really think it is useful for someone watching the video to feel so they are the operator, that's what I am looking for.

Do you edit your videos? How? Purpose, software…

I import into my Mac system and I edit with Final Cut Pro and that works for me very well. We add titles, I add an introduction, Final Cut Pro does this very well. Then we have to edit the sounds and things like that, for example timeslots of the procedures. Because you get the suction sounds in the background and everybody gets more interested in the noise so it makes it a more lifelike situation for the viewer. And then I have a dubbing track which is my commentary. So we have to find the right balance for these audio tracks. Once you have done it a few times it gets to be pretty much second nature to me these days.

Sometimes I spend a huge amount of time on editing, because I would estimate that I probably use perhaps 5% of the videos we have. In a way there are two ways of videoing, one is classic, you take a shot and the director looks at it and says where you got it right and get rid of all the rest. You do that scene by scene. This is not terribly easy if you are recording while you are doing your regular stuff, so essentially I have the camera running all the time and we capture what we do and then I come back and edit it. So that means cutting out a lot of material. And I have to think about what I am going to say in the video.

I think it is important to have a story as well as your imagery and you must be careful not to overload the viewer. The same goes with time actually, you could have endless amount of video, and you could be watching someone suture for half a hour, but important points are to show the basic aspects, show what you are trying to achieve in the beginning and what you achieved in the end, things like that. You need to leave the viewer with an educational lesson. If you go too long, you lose them. We try to keep our videos at maximum 8 to 15 minutes, so we have to edit them quite tightly in order to be able to do that. Most procedures would probably take us over hour to do at least.

Sometimes I will speed a clip up, and obviously at times we will have to cut parts of the video out, for example if I am removing a tooth, there is preparation and loosening it and sometimes it might take more time than I want to allow on video, so I will cut to where the tooth actually comes out, and that's alright. People see the obvious nature of it, but you've got to be careful not to make yourself look too slick because we are all in same situation. I don't want to train people so that they think it can all be done very quickly and easily. Implantology requires a considerable amount of sophistication these days and I think it is important to be able to make people who are coming into the field realize that, it is not as easy as many people would like to believe. We must be realistic; many people are not. Someone may think "okay, I got that under my belt", but there is a lot of need for experience and training and combining everything, and I think having this available in the form of video is very useful.

Do you publish your videos publicly? How? Purpose, channels...

I keep multiple versions of the final product, one in a relatively low resolution. So for example we sometimes we upload the videos to Vimeo and we share the link to Vimeo. Then I keep a higher resolution version, master version, to myself which is sometimes quite considerable storage aspect, sometimes 15-20 gigabytes. When I am lecturing for audience I try to use those high definition videos.

Describe your ideal video production process without limitations

I think that there is an opportunity for some more detail in videos, the editing progress, and what is done to make the story just like producing a movie or a slide presentation, these organizing principles that are worth corporating into it. The trouble is people will

want to buy these cameras and just set it up and just go with it, but you have to work on it to make it into a valuable thing and I believe it takes some time and experience. If you don't spend the time to learn the craft and technology what will happen is the cameras will sit on the side line in the same way as much of the equipment we have had over the years. If you go into some dentist office, we got some very expensive pieces of equipment that are just not being used. We are always trying to move forward but sometimes we don't spend enough time in the training and getting used to working with the tools. People tend to fall back into their old ways and that is okay, but what can be done with modern technology these days is transformative, and I think it makes the industry better, simpler and easier, and certainly more aesthetic and more functional, and we should be moving in that direction as much as possible. And this is coming from an old guy. I feel as I have been moving toward faster than any other time in my career and that is why I am still involved in it and enjoying it and loving it, really.

Interview 2 – Johanna Manninen

Background information

I've worked in the dental care industry for 15 years, recent years teaching dental hygiene at Metropolia. I also function as a "digi-mentor" for some healthcare lines of study.

Describe the role of video in your daily work

As the "digi-mentor" I teach, encourage and support teachers concerning things related to digital tools, for example how to do remote lectures and such, so that the teaching work would be as modern as possible, using the with the existing tools. I also help them with their video productions.

Video is very important to me, because our subject of study is the mouth and we have a lot of students in large groups. So the challenge is how to, as well as possible, show things from that small area to the large group of people. This is what we need video for daily, so we can show things on the big screen, and students can also view things on their own devices. It is very important that everyone can see the small area we work with. So video is an important more and more used tool for us, and it kind of has to be, since the amount of classroom teaching is decreasing.

What equipment do you use for making recordings?

We mainly record videos with iPads, this allows us to show the big picture. It is always not the best quality though. We have also used mobile devices for snapshots and videos to share with the students.

I also use the eduCam daily. When I demonstrate operations the students can practice simultaneously as they see what I am doing on the screen. So they see what I'm doing on the screen, live. It's really important for us that the students can see how and what to do. I used to have to have 5 or 6 students around me to show them how to do something, and someone maybe still didn't see what was happening. So this has been a great advantage for us. I haven't used eduCam for recording or taking still images that much, I mainly use it for the live lessons.

It might be useful to record the lessons more, but I am strict when it comes to the quality of the videos I record. It is easier to record when there aren't many students or commotion present, so that I can make a good quality video in my own paste.

What is the target audience for the videos you make?

Students. We don't really share the videos with anyone else, yet at least. My goal has been that the videos would be useful and available also to other teachers.

What challenges do you face when producing videos?

The most challenging part of making videos is probably the preparation, getting everything ready so that I wouldn't have to move or adjust the camera so much during recording.

Often I wish it was easier to make recordings while I'm doing the live instruction in the classroom. There are some challenges with it, during face-to-face teaching it's easy to go off topic. If there are questions during the class, it can be difficult to follow the conversation via the recording.

What do you find difficult when recording videos?

Some things are tricky while recording, we have the camera on a gooseneck so it easily moves off focus. There's still always a little bit off adjustments needed here and there. Some of the objects I want to be sharp are on the desk level, some are elevated, so it would be great to have a wider depth of field and easier adjustability for the gooseneck.

Do you edit your videos? How? Purpose, software…

I edit the videos I record with the iPad on iMovie. It is mainly cutting and pasting, and adding titles. It is fairly easy to use but it has its own tricks.

challenges with video editing?

I only have experience with iMovie and Quicktime, they’re pretty easy to use once you learn the basic functions. Editing is really time consuming, especially if you want to get all the cuts and transitions to look good. I think the more you edit the quicker you become.

Do you publish your videos publicly? How? Purpose, channels

We post the videos on YouTube as hidden, and post a link to them on the courses virtual platform. It is simple and easy to just share the link to the video to those who need to watch it.

Describe your ideal video production process

I think the plan, the script is the foundation for the video. To stop to think, what is the agenda for the day, what do I want to record today, and scripting it well, so that you remember to go through and record the key things.

What comes to recording itself, removing distractions, focusing on the important things, keeping the camera steady if that is the goal. Getting good quality footage, good lighting and balanced colours, no distracting shades and such. It would be ideal to get a great video in one shot, that would minimize the need for editing.

The editing tools should be so easy, there shouldn’t be any excess clicking. What I think is great about the Futudent-system is that you can share the footage of the operation directly and immediately with the patient. The easiness of sharing footage is important.
In our field it’s important that the colours are recorded realistically and the image quality is good.

In the future I would also love to have multiple angles of view, multi camera productions, so that not only the patient's mouth but also the hygienists working ergonomy could also be recorded.

Interview 3 – Dr. Eric Smith

Describe the role of video in your daily work

On a normal day we probably see anywhere from 50 to 70 patients, and I do a lot of surgery. I only use the camera on surgeries or procedures I want to record, and I normally set my day so that I don't have to take the camera off and put the camera back on.

What equipment do you use for making recordings?

A lot of dentist use Apple products, it just depends what you like, so I like the fact that Futudent is multi-platform, I use it a Android phone and edit with Mac.

The Futudent-camera is very easy to use, I am excited that there is a new camera that is smaller now, which I think is going to be better for a lot of people.

What is the target audience for the videos you make?

I don't ever do videos for myself. I'm part of Foundation for surgical excellence with three other businesses, we primarily focus on surgery for general practitioners. My videos are made for my lectures; I make videos of surgeries for general practitioners that want to do more surgery.

How do the viewers view the videos?

We have a YouTube channel and the videos are on our website, in lectures we show the videos there.

Describe your video production process

I plug the camera in to my Android phone and when I'm done recording I plug in the memory card from my phone to my Mac computer. I like the fact that you can use the camera with your phone so you don't have to have another cord. I use iMovie for editing.

What do you find difficult when recording videos?

The only problem with recording with your phone is that you have to hold it the whole time or have somebody to hold it to be able to see the preview. Then again it is so much easier just to have your phone in your pocket. we have been trying different ways. One time, I don't know how I did it, but I lost a recording and I swear that I hit save. It seems pretty intuitive when you use it, like to be able to save it. I don't know if I just didn't hit record or in the end if I didn't save it. So I don't know if that just needs to be more… I don't want to say easy but more apparent.

The most convenient way to use the camera is to use it where it goes to your phone and your back pocket, that is the easiest way, because we already have a cord to our light so we have a cord on the side of our head. So if you get more things attached to you it makes it more difficult to operate because you try to move around. But if the image is not centred or focused correctly, nobody can see it.

Do you edit your videos? How? Purpose, software…

If I have to edit the recordings I use Apple and its software, I like it, it’s easy to use.
All I usually do to my videos is I drag the video over to the where the audio is from while I was watching it with the audience. If you do surgery and you do it all the time, it is really easy to see where you are in the video. It would be nice, if you would have the ability to change the speed or the playback, being able to play it in slow motion and also fast forward. I think the ability to edit the videos is good for the industry.

Do you publish your videos publicly? How? Purpose, channels

We started publishing our stuff on YouTube channel and they’re on the website.

Describe your ideal video production process

The easier it is for the doctors to use a system the more they will use it. If something is really difficult for them to use, as far as like a software editor or this or that, then they don't want to use it or they forget.

None of us is wanting to use the camera all day, only for selected procedures. We are running from patient to patient to patient, and a lot of us have 4, 5, 6 patients at once, that is just how we work. So I might not need to record this, but now I have this camera on and it is hard to get it all disassembled. If all I had to do is just simply pull it off and put it back on, it would be really easy, if that makes sense.

I'm very excited to use the cloud software, because what we want to do for our lectures, we would like to continue to teach people after the course through the cloud. And eventually I want to be able to use the camera to do surgeries where the audience can watch the surgery live at the same time. And I would love to be able to do surgery live at my office while I broadcast it to other doctors throughout the country.

Interview 4 – Ulla Marjosola

Describe the role of video in your daily work

In teaching work, we use videos frequently as a tool for teaching, as part of teaching. So either outsourced videos we use for lessons and also our own tutorial videos. We use videos more and more. If not daily at least weekly.

What equipment do you use for making recordings?

We use the Futudent-system, also our own mobile devices, iPads have also been used. We use videos posted on YouTube by different companies.

What is the target audience for the videos you make?

Students, teachers, educators / instructors, also professionals, so we do workplace training at the workplaces and also at the campus in the Futudent -ecording facilities.

How do the viewers view the videos?

We publish the videos or just show them, for an example during a lesson, and afterwards publish them. Different teachers have different channels of publishing videos.

Describe your video production process

It is an independent process for us teachers, although it would be great if it could be a team effort. It is very time consuming especially for me, because I didn't have experience in the beginning. The more you do it the easier it gets of course.

I use iMovie for editing and it takes a lot of time, especially if I need to do something extra, use effects or something. It is a handy software but it takes time. I had to learn to use it by myself. We also use QuickTime software which you can do quite a lot with, it works on the phone and iPad. These were recommended to us in training, they're pretty quick and easy.

But as I said, it is very independent work and teachers have different skill levels, some don't edit at all and some are interested in learning more, but there is no common effort in this yet. When we're recording video we may do it as a team, of course someone has to edit it afterwards. We have recently acquired new video equipment, and we're investing and putting an effort on video technology. I think this is happening in other lines of study too. Of course in education, its largely a matter of resources.

We also make a plan before we start making a video, concerning what we're recording, what phases does it have, and what do we want. We always make a plan, it makes the realization somewhat easier and the quality of the video also. There are some teachers who have more experience in the video making and it would be great if we could have more teamwork, I could get good ideas from them.

Usually these educational videos are longer than just a few minutes, they're not maybe so viewer friendly if what comes to the length of the videos, but the educational videos for our students are usually on the longer side. Depending on the subject, if it's something you really have to learn, for an example how an instrument is used, it takes longer to teach and learn.

What challenges do you face when producing videos?

I would say being able to make the videos more periodic, and of course putting subtitles and text in it, also having the right quality and format. It would make learning the point easier for the viewers if the videos had a flow and plot in a sense, it's probably not that difficult to do that but it's quite time consuming.

What do you find difficult when recording videos?

Getting as good quality material as possible is important, sudden movements when taking a video are challenging. Learning to move slowly is important.

Autofocus on the iPad is handy, the Futudent system has its challenges for us because it is attached to the desk and not loops, it takes time to focus it and then if you have to change the setting you have to do it again. We have some kind of new system where a

student can watch on the iPad while it's being recorded, it will be good to get to know this system.

Moving the video files from one place to another can take a long time, especially since our videos are so long. We filmed one educational video with Futudent and wondered if there is its own software you can use to edit it, but when I had to transfer it to my own computer it took time, first to the USB drive or email and from there to the computer and saving it there. I have move the videos on my own computer because it has iMovie. It could be easier. Maybe we should have some other editing software available, moving files from a machine to another is so time consuming.

Do you edit your videos? How? Purpose, software…

I use iMovie for editing and it takes a lot of time, especially if I need to do something extra, use effects or something. It is a handy software but it takes time. I had to learn to use it by myself. We also use QuickTime which you can do quite a lot with, it works on the phone and iPad. These were recommended to us in training, they're pretty quick and easy. I don't really have experience with other than iMovie.

The editing is mainly cut/paste, also the iMovie has automatic settings and adjustments so it does the work, I don't know much about those… I use the automated presents and make sure everything looks good to me. For editing we use different software, people use whatever they know how to use.

Do you publish your videos publicly? How? Purpose, channels

Publishing the videos is quite easy, I publish on a YouTube channel. With Quicktime you can send a video straight to an email address and you can share the link, probably you can upload straight to YouTube too, I haven't tried that yet.

Describe your ideal video production process

It would be great if there was some kind of a checklist instruction, "check these", first we make the plan for the video of course, then figuring out what has to be considered in making the recording, and what things would make the editing easier for you, so that with

minimal effort you could carry it out and lastly the publishing, how and where.,. So in a sense, this kind of compact entity.

Not having to plan each phase separately, that would be useful for many, considering our college. Many teachers have such limited amount of time, even I would probably make more videos if there was this beginners' guide for filming and editing, or something of sorts, I'm sure it would be used more. At least I personally would be very interested in this and it would be useful.

We are very open to new things here in the school, we also have a "digi-mentor" on our line of study. Of course they have a lot of work themselves, but the future looks positive with all the new digital applications, maybe even more positive than in some other lines of study.

Interview 5 – Dr. Sonny Torres Oliva

Background

I would say I've been in the business almost 48 years, dad owned a laboratory, all my family is in dentistry business, graduated in 2003, so that would make almost 15 years.

Describe the role of video in your daily work

Daily I focus more on general dentistry, but we also do a lot of reconstructive work. It is important to me to record and have documents of my patients because of the fact that I also teach. I also have been a trainer for several companies over the years and I have offered my support and my expertise to some of these companies. It is important to document my cases not only for education, but also for documentation.

What equipment do you use for making recordings?

For images I have digital cameras, I have several means of recording static images those would be just a DSLR. I also use interval camera, I have two types, one is the Sopro camera, SOPROLIFE. Those are my main recording equipment. Sometimes I will record on the iPhone. As far as live video, I actually have a microscope/video recorder, it's a fully functional video recorder with zoom, it can take stills, it can take video at 1080p, the price point for it is deep. It has automatic rotating, if you are looking at the screen straight up you can see it on the screen as you are seeing it on the patient, it flips the image automatically.

In my opinion the Futudent-platform suits perfectly with beginning dentist and with somebody who wants portability or someone like me who lectures hand on cases, I do a lot of laboratory cases and sometimes in the field the Futudent-camera is the easiest to set up.

What is the target audience for the videos you make?

On lectures other dentists and they are also documentation for myself.

How do the viewers view the videos?

During lectures, I also have a system with the ability for live streaming

Describe your video production process

I rather have my camera on stationary platform, I mount it on my light. I record a lot, I am also trying to improve the process and the quality of recordings

What do you find difficult when recording videos?

With some light sources there is flickering on the video recording, I think it has to do with the frequencies of the light.

Do you edit your videos? How? Purpose, software…

I edit videos Adobe Premiere, because not only do I edit, I also add captions and depictions, it is important to me that I can do all those things.

Do you publish your videos publicly? How? Purpose, channels

Right now I am not publishing videos, they're are mainly for lectures and such

Describe your ideal video production process without limitations

With the Futudent-camera, I think the price point and the portability are great.
I would love if there was more control over the white balance and colour correction. I understand that the Futudent-camera is a manually focused camera, it requires a fixed distance or working distance which is fine, because of the price point and size of the camera, I understand there are limitations with putting a lot of mechanisms in it. I would love autofocus though.

I would also love if there was this automatic rotation system, so the perspective would always be right. I could watch certain things on the screen. The screen is a lot bigger and I can see the patient a lot better there.

Another feature that Futudent should add is when you are exporting images on your hard drive or whatever storage device you have, that you would have a built in compression system, so you would have some more options with the compression. It would be useful especially when recording longer videos.

At the moment with the camera I have to run a long cable to the computer so there is the issue of how stable the cables are, and sometimes the cable would hang annoyingly. Maybe in the future Futudent will have the capability of doing a wireless connection, that would be a cool feature.

Another cool feature would be having the possibility for people to log on to the video signal on their iPads and watch it in real time, doing that for an example with a Bluetooth connection.